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ORGANIZING FOR INFORMATION PROCESSING IN THE AUSTIN PUBLIC SCHOOLS. INITIAL REPORT.

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THE APPLICATION OF COMPUTER TECHNIQUES TO PROCESSING AND ANALYZING INFORMATION GATHERED IN SCHOOL-SYSTEM FILES WAS INVESTIGATED. THE STUDY WAS PLANNED TO (1) IDENTIFY JOBS PRESENTLY PERFORMED BY HAND IN THE AUSTIN PUBLIC SCHOOLS WHICH COULD BE EFFICIENTLY AND ECONOMICALLY PERFORMED BY MACHINES, (2) DESCRIBE MACHINE-APPLICATION JOBS WHICH ARE NOT PRESENTLY PERFORMED BECAUSE OF LIMITED CLERICAL AND PROFESSIONAL HELP, AND (3) EFFECT A SYSTEMATIC AND UNIFIED APPROACH TO THE ORGANIZATION OF INFORMATION FOR PROCESSING AND ANALYSIS. THE INVESTIGATORS CONCLUDED THAT, OF THE INFORMATION GATHERED IN THE PUBLIC SCHOOLS, THE FOLLOWING COULD BE PROCESSED BY A COMPUTER-BASED SYSTEM--PUPIL-PERSONNEL RECORDS (SINGLE SCHOOL), SCHOOL REPORTS AND RECORDS, SYSTEM-WIDE PUPIL REPORTS, EMPLOYEE-PERSONNEL RECORDS, BUSINESS OFFICE PROCEDURES, AND PUPIL-PERSONNEL RECORDS (SCHOOL-WIDE). SOME OF POSSIBLE EXTENSIONS OF SERVICES WERE LISTED. CONTINUED PLANNING WAS SUGGESTED FOR THE IMPLEMENTATION OF A COMPUTER-BASED INFORMATION SYSTEM IN AN ELEMENTARY SCHOOL, A JUNIOR HIGH SCHOOL, AND A SENIOR HIGH SCHOOL. DETERMINATIONS WHICH SHOULD BE MADE INCLUDE (1) WHAT INFORMATION IS NEEDED, (2) HOW THE INFORMATION WILL BE GATHERED, (3) WHAT THE ORGANIZATION OF THE MATERIALS ON THE INPUT-DOCUMENT SHOULD BE, AND (4) WHAT USE WOULD BE MADE OF THE INFORMATION. A SCHEDULE FOR STAFFING AND SUPPORTING THE CONTINUING WORK WAS INCLUDED. (TC)

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ORGANIZING FOR INFORMATION PROCESSING IN THE AUSTIN PUBLIC SCHOOLS

(INITIAL REPORT)

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I. Rationale for a Computer-Based Information System

Methods for gathering information within the school system have far outrun the ability of the personnel to use the information effectively. Answers to questions of concern to the educator are available but often the answers are buried in files in many different offices with limited clerical help to ferret them out. As a result, the questions must be answered by "judgment" and the answer depends more and more upon the individual making the judgment. In the rush to have information available in the places it is needed at the time it is needed, many duplicate files are kept, necessitating clerical help for continual updating. In addition, such files invariably lead to summary files and cards, thus requiring not only the reproduction of information but also the analysis of the information.

Utilization of computer techniques and hardware offers help in this important area. Certainly it must be recognized that the computer will not solve all the problems connected with information processing and analysis; however, its characteristics of speed, large storage capacity, accuracy, and availability offer services which can help to ease the situation.

As indicated, the major problems arise in two areas: processing and analyzing. Processing has been carried on by computer within public schools for many years. Various methods of maintaining pupil-personnel records have been developed in many parts of the country, both on school system and statewide bases. These systems have been chiefly concerned with the gathering of information and the printing of it in various formats for the use of the professional staff. In some cases the data have been manipulated to produce some summary reports for use within the school. In this second phase the area of analysis is brought in. Analysis infers the looking at data, making decisions, and reporting the results. This function of the computer has been less exploited than the processing func-

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tion. A few systems have developed programs to provide reports required by local or state officials; fewer have used it in an attempt at evaluation within the school system -- that is, in a continuing research program.

The applications of computer science to public education have proceeded along various lines during recent years. In general, the applications have grown from initial utilization in the business area, to pupil records, to research, to instructional uses. Except for the first area (business office procedures) and part of the second (attendance and periodic grade-reporting) applications have remained partial and experimental, financed through publicly or privately supported grants and pilot programs. In the area of pupil records common practices for reproducing data for periodic and permanent reports have been developed in individual schools, school systems, and on a state-wide basis. Each of these systems has a varied amount of retrievability potential for future research. There have been few attempts to tie together the entire information system into a unitary whole in order to avoid duplication of effort and to produce effective planning of input and maximal use of output.

The problem presented at the present time, therefore, is to identify jobs presently performed in the Austin Public Schools which could be efficiently and economically performed by machines; to describe machine-application jobs which are not presently performed because of limited clerical and professional help, the results of which would make a positive contribution to the programs of the school; and to effect a systematic and unified approach to the organization of information for processing and analysis.

To be considered for machine application, a job must not only be possible with the machine but it must also be feasible. Feasibility implies either that the job can be done better (more economically, more efficiently, more accurately, and/or at a lower professional level) or that the job enables other jobs to be done better. Under the latter category would fall jobs in which machine applications offer no immediate advantages, but in which the information thus pro-

duced effects ultimate advantages; for example, attendance reporting. Most of the attendance systems now in use offer little advantage to the professional or clerical staff in the day-by-day accounting of absentees; however, the advantage of having the information in machine retrievable form contributes in time efficiency, and accuracy in compiling periodic reports on a grade level, school, and system basis, as well as in continuing studies of attendance patterns.

In addition, feasibility also includes a consideration of volume. Machine operations may not be feasible under the first criteria until a certain volume of operation has been reached. For example, the effort required to schedule a school of 150 students by machine may be greater than the effort to do the same job by hand. At some level, however, the reverse is true. The exact criteria at this level is more difficult to establish; it is again obvious that the use of the by-products generated must be considered. Although the effort in the job is greater than would be required to do the job by hand (schedule of a small school), if the job produces products that would have to be obtained by hand operation later (class cards for grading purposes), the output may justify the time expended. Thus each job must be considered not only in itself but in its contribution to other jobs.

The extension of analysis depends upon the questions to which the school system desires answers. There are certain areas which would be valuable each year or at certain periods (budget accounts, sick leave analysis, grading analysis) and could be produced on a regular basis. Of greater service is the abili to analyze current data to answer current, one-time questions, and to carry on selected research projects.

II. Present Status of Data Processing within the Austin Public Schools

At the present time the Austin Public Schools lease the following IBM equipment:

403 Accounting machine

Reproducing Punch

Interpreter

Sorter

Key Punch (an additional key punch is on temporary loan from the city)

Verifier

Collator

The equipment is installed in a small room at the central administrative offices. The operation is under the direct supervision of the Business Manager for the schools. A technician is employed for machine operation and supervision and as a technical consultant. A full-time key punch operator with some duties in machine operation is also employed. A similar machine installation is maintained at Stephen F. Austin High School for instructional purposes.

Although the equipment was installed at the request of the Business Manager and primarily for business applications, the equipment is available for applications in other departments. The Director of Pupil Accounting is at present using this equipment.

The chief application of data processing to the business operations of the schools is in payroll and related areas. According to the Business Manager, very little if any time is saved in the actual monthly payroll procedures. The saving in time comes from the machine production of W-2 forms and periodic and end of the year reports, such as teacher retirement, withholding tax, social security reports. In instituting the present procedures, which operate on a monthly updating process originating in the individual unit, certain changes in the form of reports were made. For instance, under the previous system a card was kept for each teacher for a four year period reflecting his salary by the month; under the present system this information is available by reference to monthly reports. Of course, such a cumulative report would be available if the Business Manager felt the product justified the machine and personnel time involved. All such changes were justified in the light of improved efficiency.

In progress at the present time are plans for converting the accounts payable to machine operation. This application will include the writing of checks and the updating of budget accounts. In addition, information for budget planning will be readily available. Possible extension into the area of inventory of capital equipment and of warehouse inventory are under consideration.

The Director of Child Accounting with the cooperation of the Business Manager and the Data Processing Technician has devised routines utilizing the capabilities of the 403 in applications to summary attendance accounting. In addition, a system to aid in census records is presently being put into effect and will be utilized fully during the January, 1966, census. Both of these applications were instituted primarily for accuracy and for economy in clerical time.

Each school keeps its own attendance records in the class register. Practices vary by schools and levels from a classroom register kept by the teacher to a register for grade level kept by central clerical staff. A summary report for each register is made on a prepared form (G-50) at the end of each six weeks period. This summary information is punched, and grade level and school summary reports are prepared. Due to limitations of the equipment, computations of ADA and ADM are still done manually. A cumulative card for each school is punched for cross-checking. This card is updated at the end of each six weeks reporting period. In addition, the age-grade distribution annual report for the Texas Education Agency is prepared from the six weeks information.

Presently in execution for the first time in Austin is a procedure to aid in the annual census. The approach calls for the punching of family data into a set of three types of cards. From this information a census enrollment blank will be pre-printed. The census-taker will have the responsibility of checking the information and making changes or additions. This approach will assure an enrollment blank for each home and will allow for easy accounting of those who have been missed. In addition, the pre-punched information when up-dated will

provide current information about school population by elementary district and will facilitate the compiling of reports required by the Texas Education Agency.

III. Organizing for Information Processing -- A Recommended Approach

Institution of a computer-based information system falls into two parts: organizing input data and using input data to produce meaningful output. These two functions cannot be considered separately, however. The organization of the input data will depend to some degree upon the output that is desired, especially in the selection of materials to be used in the system.

Information within the school system can be divided into three large divisions: pupil-personnel information, employee-personnel information, and supplies, buildings, and equipment information. The one factor which all of these items have in common is that they are assigned to a single administrative division, i.e. building, department, area. The basic organizing unit for information processing, therefore, is the administrative unit.

This particular type of organization offers many advantages which would not be available under a more "gross", all-inclusive type of arrangement. Each administrative unit can retain a certain amount of autonomy; services can be instituted in one unit without affecting other units. Thus in initiating services, one unit can serve as a pilot to prove the approach before expanding it to others.

In addition, a large central record system becomes unnecessary. Under a system-wide organization, a central control would have to be maintained in order to clear all identifying numbers. Under a unit system, new identification numbers can be assigned at the local unit without regard to other units, since the unit number will be the key to the identification of all entities.

Such a unit organization system does not, however, limit the possibilities of composite use of the information. All-inclusive reports and analyses can still be carried out, and upon completion, input medium can be re-sorted by the administrative unit number.

Information concerning these three large divisions of the school system can be divided into two categories: personal and school associated. School associated can be further divided into two areas -- history and current. Personal information is that information which is associated with the individual as an individual in any context; i.e., his name, address, sex, birthdate, etc. (For property the type of information is the same, labels would differ). School associated information is that information which is gathered as a result of the person or thing being associated with the school; i.e., grades, salary, assignment, budget item. For school associate items, both history records (school associated events of the past which are not subject to change) and current events (school associated events which are being cumulated during the present year) are included.

History information and personal information will generally be non-changing. Current information will be changed at regular intervals as new information is added. At a given time current information will become (or be converted to) history information. There are areas of history and personal information which will be updated continually (change of address, marital status, assignment); in addition transfer to another administrative unit assignment will result in the necessity of changing the identifying numbers on all input information.

Such an organization as described above would necessitate the assigning of a three digit code number to all administrative units. This code would become the first three digits of all identifying numbers for the specific entity. For example, the system could work in the following way. The first digit of the three digit code would indicate the area: 0 indicates a secondary school; 1 indicates an elementary school; 2 indicates a division of pupil personnel services. The second two digits would indicate the specific division: 001 indicates Stephen F. Austin High School; 104 indicates Blanton Elementary School; 204 indicates Visiting Teacher Division of Pupil Personnel. Every piece of input data would contain this identifying number.

For pupil and employee personnel an additional five digit number would be used to indicate the specific person involved. In property accounting, a six digit number would be used. These numbers would be assigned within the administrative unit involved. All information on a system-wide level, therefore, would be organized on this administrative unit basis rather than on a strictly alphabetic or numeric arrangement as has become customary. Although in some cases the alphabetic arrangement would be more convenient, such as in census cards, the problems which such an approach creates in necessitating a system-wide numbering system creates more problems than it would eliminate.

The information to be included in the input data would consist of two types: actual numeric or alphameric information and coded information. The decision to use one or both of these types would be determined by the use of the input data. For example, on some input mediums it would be necessary to include both the number (3 digits) and the name of the individual (in personal information) if the input medium was to be used for visual interpretation and/or if the alphameric information was desired for output. For some information, only the number would be necessary to tie it in with other input. Some information would always be coded (sex, marital status, grade status). These decisions would be made at the time that formats for input and output were being devised.

The selection of information to be included in the input medium is dependent almost entirely upon the output desired. It is useless to include information which is not going to be used or which has only a limited reference. Information such as locker number might be useless in one school setting where it was only an initial assignment with no later reference. In this case a simple card file would suffice. The same might hold true for certain health information and parent permission slips required of all students. This information is assumed to exist for all students and its presence in the file need not be indicated in most cases. However, a final determination as to what specific information is to be included cannot be made until a determination is made concerning utilization.

IV. Possible Services Under a Computer-Based Information System

It would be impractical if not impossible to list services which would be available under a computer-based system of information retrieval. It is not impractical, however, to indicate the areas of possible service both in areas now covered as well as in extensions of service made possible through a computer-based system.

Of the information now in the public schools, the following could be served by a computer-based system:

Pupil-personnel records (Single School)
1. Report Cards
2. Permanent Records (transcripts)
3. Attendance Records
4. Personal Information
5. Fee Records

School Reports and Records
1. attendance
2. Honor Rolls and Special Lists
3. Test Results Listings

Systen-wide Pupil Reports
1. Census Data
2. Attendance Data
3. System-wide Norms for Tests
4. Test Scoring

Employee-personnel Records
1. Cumulative Reports on Teachers (salary, assignment, experience, training, etc.)
2. Payroll production with summary reports
3. Special studies of leaves, training, experience, etc.

Business Office Procedures
1. Accounts Payable
2. Property Inventory
3. Budget Analysis
4. Text Book Accounting

Pupil-personnel Records (school-wide)
1. Testing Record for Elementary Students
2. Special Services Record (visiting teacher, special education, special testing)

Due to limitations in time and personnel, much useful compilation and analysis of information is not now available. Some of these are immediately obvious; however, more of these applications are noted as the school moves into a computer-based system and has the information stored for use. Some of the possible extensions of services are as follows:

Pupil-personnel Records
1. Additional copies of records for use by personnel

2. Special reports on students -- failures, interest and achievement patterns, "underachievers".
3. Follow-up studies of students both within the school system and after graduation or departure.

School reports and records

1. Analysis of grades assigned by teachers
2. Scoring of teacher-made tests
3. Complete analysis of standardized test results (with studies of relationship to other data as desired)

System-wide Pupil Data

1. Complete production of standardized test norms with studies of relationship to other data
2. Unified record of central office pupil personnel records with multiple copies for the offices desiring the information

Employee-personnel Records

1. Files for applicants
2. Cross-reference for selecting employees with certain qualifications
3. Production of studies concerned with a pattern of hiring, retirement, resignations, training, assignments

Business Office Procedures

1. Extended analysis of spending and revenues
2. Unified system of purchase, paying, delivery, and accounting for supplies and equipment

V. Next Phase of the Project

The foregoing statement presents the immediate situation in relation to data processing within the Austin Public Schools. In addition a plan of organization has been presented under which additional data processing services can be instituted on a pilot basis and later expanded as the system may desire. Although simultaneous implementation would be highly desireable, from a service standpoint such a procedure is impossible for several reasons. First, paper planning does not assure a smoothly operating program; therefore, a pilot program for proving and improving the approaches is necessary. Second, a computer-based program is a growing one, each step depending upon the successful fomplete tion of the previous one; therefore, steps at each level of operation must be perfected before moving into the next. Third, in order to insure a continuity of records, the change-over must be made one step at a time.

Such a program as has been outlined can be implemented either by extending a single service to all schools or by extending many services to a few schools.

The latter approach is desirable because if offers the opportunity to test the approaches on a comparatively small number of cases. Thus changes in procedure are more easily accomplished.

In the present case of the Austin Public Schools, it is suggested that continued planning for implementation of a computer-based information system be carried on in an elementary school, a junior high school, and a senior high school. This planning should involve pupil-personnel and employee-personnel areas. The area of property and business applications,being already partially developed, should not be distrubed; however, the business manager should be involved in all such continued planning in order to parallel the present systems and to facilitate the inclusion of these procedures if desired.

The planning at this level would involve a survey of information which is now collected and a listing of the use made of these materials. From this point, plans can be made for collecting the information for data processing. Determinations which must be made include what information is needed, how the information will be gathered, what the organization of thematerials on the input document should be, and what use will be made of the information. All of these questions will necessitate studying the materials now on file and the use of these materials. School personnel must be involved in the study of the materials and in making plans for transferring present files to input medium.

This planning must proceed with the full knowledge and cooperation of the personnel involved, including the teachers in the schools. It is important that the administration of the schools be interested in investigating the possibilities and be flexible enough to modify present procedures when necessary. In addition the personnel must realize that the initial stages -- planning and implementation -- will require time and energy beyond that now expended; the end, however, will justify the energy that is expended now.

In addition to working with a school in pupil-personnel records, it is recommended that continued planning with the Director of personnel and with the Director of Guidance be carried on with the objective of doing some pilot work in these areas in the schools that will be serviced and on a school-wide basis.

The Research and Development Center is ready now to continue work in this area as outlined above.

VI. Staffing and Supporting the Continuing Work

Barring unforseen delays, the Information Processing Project will quickly move from planning to implementation as the next phase is undertaken. Delays in obtaining printed card formats necessitate the early design and order of these materials in order to make them available during the spring. Under the present plans, the following schedule will be observed:

January:* Initial planning with the individual schools
Design of formats for input cards
Ordering of cards

February: Initial plans for converting present information to input
Initial assignment of identifying numbers to entities involved in the initial phase of the project
Programming for initial listings of information

March: Information collected and punched into cards
Plans for implementing periodic reporting during 1966-67
Plans for aid in scheduling for 1966-67
Additional card formats designed for grading, history records, and other 1966-67 areas of service.

April: Course choice and student scheduling
Proof of information input (student-personnel)

* In cases where this schedule applies to school operations (i.e., scheduling) the dates are merely suggested ones and will be changed to fit the plans of the schools involved.

May: Programs for reporting and related areas

Programs for permanent records

Plans for employee-personnel files

Plans for analysis of fall achievement testing

June: Miscellaneous programs for additional analysis of information

Employee-personnel files completed as employees are assigned for 1966-67 school year

Programs for employee-personnel analysis

July: Completed plans for grading and history records

Attendance reporting for 1966-67 planned

August: Handbook for use by administrators and school personnel for procedures connected with the Information Processing Operation within the schools

Technical handbook abstracting the programs to be used in the project

Requirements for continuing the program of Information Processing for the Austin Public Schools involve three areas: personnel, equipment, and materials. It is assumed that the Research and Development Center will furnish the major portion of the equipment and materials as the project is instituted. As extensions of the services are made at the request of the schools it is assumed that the AISD will share more and more in these expenses.

The services of Mr. Bill Lamkin of the R & D Center will continue to be available as consultant and as coordinator of the project. As stated earlier the cooperation and enthusiasm of the personnel of the schools is essential to the success of the program. It is not anticipated that additional personnel will be needed by the schools in fulfilling their part of the initial implementation of the program. It is expected that the initial keypunch jobs will be carried out by the classes in the Austin Public Schools as a part of the instructional program. The services of the keypunch operators in the R & D Data Processing Center will

be available for work in corrections and updating.

Equipment available in the R & D Data Processing Center and in the Computer Assisted Instruction Center will be available for the computer work. This equipment includes an IBM 1401 system and related hardware. Equipment within the schools may be called upon when the use would serve instructional purposes, or in case of emergencies,with the approval of the school officials.

Initially, and so long as it shall remain a model system only, the materials which will be necessary will be purchased by the R & D Center. As the system is extended to other areas of the AISD, a proportionate share of the costs will be borne by the AISD. The attached table gives an estimated account of the cost of materials for this program during the first year of operation (1966-67).

Addendum: As a service to the R & D Center and as an initial trial of the personnel-information system, it is suggested that an input file be compiled for employees of the R & D Center as reference for reports and for general information of interest to the directors and members of the Center. Such a system could be instituted immediately with minimum cost in cards and paper.

INFORMATION PROCESSING PROJECT -- MATERIALS FOR 1966-67

January, 1966	
4 card formats at $75 each *	$300.00
May, 1966	
2 card formats at $75 each	$150.00
July, 1966	
Report Card Pre-printed Form	$300.00
Supplies of stock paper and cards	$300.00
September -- June, 1967	
Rental for local mark sense equipment **	$100.00
Total	$1150.00

* each card format order includes 50,000 cards

** time on mark sense equipment can be purchased locally if such a feature is not available at that time on campus equipment.